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Sickness absence and psychosocial work conditions: a multilevel study

Corné A. M. Roelen^{1,2}, Sabine H. Weites³, Petra C. Koopmans^{2,4}, Jac J. L. van der Klink² and Johan W. Groothoff²

Background	Psychosocial work conditions, particularly psychological job demands, are inconsistently associated with sickness absence rates. This might be the result of investigating the psychosocial work environment at the individual level, reflecting personal perceptions rather than actual demands.
Aim	To investigate associations between sickness absence and psychosocial work conditions at both the individual and the workplace level.
Methods	A cross-sectional study of insurance company employees ($n = 395$) in four departments. Psychological job demands, job control and job support were investigated at the individual level using the self-completed Questionnaire on Experience and Assessment of Work. An external occupational psychologist interviewed the supervisor and a group of employees of each department, assessing job demands, job control, job support and psychological distress at the workplace level. These data were related to the number of short (1–7 days), medium (8–21 days) and long (>21 days) episodes of sickness absence in the period January 2001 to December 2002.
Results	A total of 244 questionnaires (62%) were suitable for analysis. Quantitative job control scores at the individual level differed from qualitative data at the workplace level. Self-assessed job demands and control were unrelated to sickness absence. The rates of short and long episodes of absence were higher in the department with combined high demands and low control, assessed at the workplace level.
Conclusions	The associations between psychosocial work conditions and sickness absence depended on the level at which the former were assessed. More multilevel research is needed to disentangle the relations between psychosocial work conditions and sickness absence.
Key words	Occupation; occupational psychology; psychosocial work conditions; sickness absence.

Introduction

The nature of work has changed profoundly in the last few decades. Nowadays, job characteristics rarely exceed the physical capabilities of workers and demands such as work pace, time pressure, complexity of work and conflicting tasks act as stressors. Karasek's demand-control model is the leading work stress model in occupational health psychology [1]. According to this model, job control provides resources to deal with demands. The source of strain is to be found in work that combines high demands and low control [1,2]. Many studies have tested

this hypothesis, but the results do not always support it. van der Doef and Maes [3] showed that 28 of 41 studies examining the relationship between job characteristics and psychological well-being supported the strain hypothesis. De Lange *et al.* [4] found support for the hypothesis in eight of 19 high-quality studies. They suggested using other outcome variables, such as recorded sickness absence, to provide a more comprehensive picture of the effects of psychosocial work conditions on health.

Most studies on the associations between psychosocial work conditions and sickness absence, however, have investigated the effects of demands and control separately, reporting job control to be the strongest predictor of sickness absence [5,6]. Kondo *et al.* [7] investigated the association of combined high demands and low control with sickness absence. Compared to the lowest tertile of the ratio demand to control, they found the highest tertile to be significantly correlated with an increased risk of sickness absence at follow-up. High-strain jobs were also

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found to be associated with sickness absence and recurring spells of sick leave in the Belgian workforce [8].

The majority of studies on psychosocial work characteristics examined self-report measures [4]. The investigation of self-reported psychosocial work conditions may reflect personal perceptions rather than the actual work environment. One way to address this problem is to measure the psychosocial work environment by workplace observations [9]. Using this approach, Christensen *et al.* [10] reported workplace differences in the relation between sickness absence and psychosocial work characteristics, suggesting the importance of multilevel studies. The measurement of psychosocial work characteristics was demonstrated to be biased by gender, age and occupational group. Bias was much weaker or disappeared when the population was divided into principal occupational groups and analyzed in relation to the same organizational and economic characteristics [11].

We found no studies investigating psychosocial work conditions and sickness absence at different levels in the same population. Therefore, the present study investigated the association of recorded sickness absence with job demands and job control assessed at two levels in one company: the individual level and the workplace (i.e. departmental) level. The research questions were as follows:

- (i) Are self-assessed psychosocial work conditions related to sickness absence?
- (ii) Are independently rated workplace psychosocial work conditions related to sickness absence?

The objective of the study was to compare the results of both approaches.

Methods

This multilevel study was designed according to Marklund *et al.* [12] who collected individual data by means of a survey of the employees and workplace data by interviews. We collected individual data with the Questionnaire on Experience and Assessment of Work in January 2002. This questionnaire is based on the Job Content Questionnaire and used in Dutch and Belgian research on psychosocial work characteristics [13,14]. It consists of 108 questions on work and work conditions, which were answered on a four-point Likert-type scale ranging from 1 (=always) to 4 (=never). It was developed and validated by Van Veldhoven and Meijman [15]. They measured the construct validity (H) of the subscales. Mokken reported that scales with $H > 0.40$ were adequately unidimensional [16]. The internal consistency of the subscales was characterized by rho (ρ), and scales with $\rho > 0.80$ were considered to be adequately consistent [17]. For this study, we used the following subscales: psy-

chological job demands (11 items on workload, work pace, time pressure, conflicting demands and work accumulation; $H = 0.51$ and $\rho = 0.87$), control over work (11 items on task discretion, task variety and decision-making authority over the content of work and its pace; $H = 0.44$ and $\rho = 0.90$), coworker support (9 items on relationships with colleagues, appreciation, collaboration and ambience; $H = 0.52$ and $\rho = 0.87$) and supervisor support (9 items on the relationship with the supervisor, appreciation and disputes; $H = 0.58$ and $\rho = 0.90$). We sought ethical approval from the Medical Ethics Committee of the University Medical Center Groningen, who advised that ethical clearance was not required.

The study subjects worked in an insurance company with four departments: health insurance (A), public relations (B), finance and control (C) and indemnity insurance (D). All employees were office workers doing computer work. The employees of both insurance departments and the public relations department also had customer service tasks. Some employees of the indemnity insurance department worked as outdoor insurance agents. Departmental sickness absence levels were calculated as

$$\frac{\text{total number of absence days of the department}}{(\text{number of employees in the department} \times 365)} \times 100\%.$$

Departmental sickness absence levels were highest in departments C (7%) and D (7%), whereas departments A and B had absence levels of 3 and 2%, respectively.

An external occupational health psychologist assessed the psychosocial environment of each department by interviewing the supervisor and a group of employees representing the department. The interviews gathered qualitative information about job demands, job control, job support and psychological distress as mentioned by the group, without using quantitative measures or score tables. Table 1 summarizes the outcome of these interviews. The employees working in departments A and B felt no distress; they were combined to form a reference group. The employees of department C mentioned high

Table 1. Psychosocial work conditions at the workplace level

	Department			
	A	B	C	D
Number of employees	94	51	78	172
Job demands	High	Normal ^a	High	High
Job control	Normal ^a	High	Normal ^a	Low
Job support	High	High	High	High
Psychological distress	Low	Low	High	High

The results of the semi-structured qualitative interviews by an external expert, exploring the workplace psychosocial characteristics of the four departments.

^aNormal means that the characteristic was rated as 'neither high nor low'.

job demands but normal control. Employees working in department D mentioned combined high demands and low control.

We recorded the first and last dates of all absences in 2001 and 2002 and calculated the number of episodes absent in this 2-year period for each employee. Short episodes (1–7 days), medium duration episodes (8–21 days) and long episodes (>21 days) of absence were considered separately. The number of absence episodes is a form of count data, for which Poisson regression model was computed using GENLOG for general log-linear analysis in SPSS for Windows version 14. In Poisson regression analysis, the dependent variable y has a distribution given the independent variables x_1, x_2, \dots, x_i :

$$P(y = k | x_1, x_2, \dots, x_i) = e^{-\mu} \mu^k / k! \quad \text{with } k = 0, 1, 2, 3, \dots$$

The logarithm of the mean μ is assumed to be a linear function of the independent variables:

$$\log(\mu) = \text{intercept} + b_1 \times x_1 + b_2 \times x_2 + \dots + b_i \times x_i$$

The Poisson distribution implies that the variance is equal to the mean (μ).

The Poisson model was a good fit for the number of medium duration absence episodes [likelihood ratio (LR) = 196; df = 221; $P = 0.89$] and the number of long absence episodes (LR = 151; df = 221; $P = 1.00$). The variance in the number of short episodes, however, was greater than the mean resulting in overdispersion. Therefore, a zero-inflated negative binomial distribution was estimated for the short episodes, using Transition Data Analysis version 6.4f. The negative binomial distribution

proved to be a better fit for the number of short absence episodes. Age and gender were controlled for in both the negative binomial and the Poisson regression analysis. External factors such as marital state, number of children, household income and social support outside work were not controlled for.

Results

Of the 395 employed subjects, 265 (67%) returned their questionnaire. Table 2 shows the participation rates in each department. The response rate in department D was relatively low [97/172 (56%)], particularly among the female employees. The age distributions in non-participants did not differ from those in the participants. The non-participants in departments A + B (reference group) had more absences in the 2-year period of study than participants, as 40 non-participants (80%) had one or more short episodes of absence compared to 72% of the participants, 16 non-participants (32%) had one or more medium episodes of absence compared to 22% of the participants and 11 non-participants (22%) had one or more long episodes of absence compared to 13% of the participants. In departments C and D, the participants tended to have more absences (Table 2).

Of the returned 265 questionnaires, 21 had to be excluded because they were not complete. The questionnaires of 244 participants were eligible for statistical analysis. Table 3 shows the self-assessed psychosocial work conditions in each department. Higher scores were more unfavorable from the demand–control point of view. The employees working in department C had higher

Table 2. Participants and non-participants and their sickness absence data

Department	Participants			Non-participants		
	A + B	C	D	A + B	C	D
Number	95 (66%)	52 (67%)	97 (56%)	50 (34%)	26 (33%)	75 (44%)
Number of men	52	14	37	32	9	23
Number of women	43	38	60	18	17	52
Mean age (SD)	40.8 (9.43)	37.9 (7.61)	38.0 (8.77)	39.9 (7.93)	38.7 (4.45)	38.9 (7.22)
Workers with:						
0 short episodes	27 (28%)	10 (19%)	22 (22%)	10 (20%)	5 (19%)	17 (23%)
1 short episode	26 (27%)	14 (27%)	17 (18%)	10 (20%)	6 (23%)	12 (16%)
2 short episodes	16 (17%)	10 (19%)	14 (14%)	8 (16%)	7 (27%)	14 (19%)
3 short episodes	11 (12%)	2 (4%)	17 (18%)	6 (12%)	2 (8%)	6 (8%)
≥4 short episodes	15 (16%)	16 (31%)	27 (28%)	16 (32%)	6 (23%)	26 (34%)
0 medium episodes	74 (78%)	39 (75%)	72 (74%)	34 (68%)	21 (81%)	56 (75%)
1 medium episode	16 (17%)	8 (15%)	20 (21%)	9 (18%)	4 (15%)	13 (17%)
≥2 medium episodes	5 (5%)	5 (10%)	5 (5%)	7 (14%)	1 (4%)	6 (8%)
0 long episodes	83 (87%)	45 (87%)	74 (76%)	39 (78%)	25 (96%)	63 (84%)
1 long episode	9 (10%)	6 (11%)	18 (19%)	8 (16%)	1 (4%)	10 (13%)
≥2 long episodes	3 (3%)	1 (2%)	5 (5%)	3 (6%)	0	2 (3%)

Number (%) of participants and non-participants and their mean age in January 2002. The table also shows the number of persons with 0, 1, 2, 3 or ≥4 short absences, 0, 1 or ≥2 medium absences and 0, 1 or ≥2 long episodes of absence in the 2-year period of study; SD = standard deviation; departments A + B constitute the reference group.

scores on job demands, which meant that they perceived higher demands than the reference group. However, the higher scores on job control meant that they experienced less control over work than the reference group. The lower scores on supervisor support meant that the personnel of department C perceived more support from their supervisor than the reference group.

Table 4 shows the associations of sickness absence with psychosocial work conditions at the individual and the workplace level. The rates of short episodes of absence were unrelated to self-assessed work characteristics, although the rates of combined high demands and low control (demands \times control) was on the verge of significance ($P = 0.05$) with a rate ratio (RR) of 1.1 and a 95% confidence interval (95% CI) of 1.0–1.1. The rates of short duration absence were higher in department D (RR = 1.5; 95% CI = 1.1–2.0; $P < 0.01$) than in the reference group. Department C had non-significant higher rates of

short duration absence (RR = 1.3; 95% CI = 0.9–2.0; $P = 0.23$) compared to the reference group. The rate of medium duration absence was also higher in department C (RR = 1.5; 95% CI = 0.8–3.0; $P = 0.18$) but again not significantly higher than the rate in the reference group.

Long duration absence was associated with self-assessed coworker support at the individual level. The rate of long episodes of absence was higher in department D (RR = 2.0; 95% CI = 1.0–3.9; $P = 0.02$) relative to the reference group.

Discussion

The results of this multilevel study on psychosocial work conditions showed that individual employees' perception of job control differed from control assessed at the workplace level. Moreover, self-reported job demands, control and their combination were not significantly associated with sickness absence, whereas the rates of short and long absences were higher in the department with independently assessed high demands and low control.

The strength of the present study is that it investigated psychosocial work conditions at different levels (individual and departmental) in the same population. In this way, we were able to compare the results at both levels although the individual results were quantitative data and the results at the workplace level were qualitative. The workplace interviews were performed by one occupational health psychologist, excluding interobserver bias. However, the repeatability and interobserver agreement of the interview results could not be determined.

The study had some other limitations. First, the response rate was moderate (67%) and there were some indications that sickness absence among non-participants differed from participants, which could have biased the

Table 3. Psychosocial work conditions perceived at the individual level

	Department		
	A + B (reference)	C	D
Psychological demands	73 (16)	83 (14)**	76 (16)
Control over work	37 (14)	55 (25)**	36 (17)
Coworker support	22 (12)	19 (11)	22 (11)
Supervisor support	20 (14)	15 (14)*	19 (13)

Mean (standard deviation) scores of the subscales of the Questionnaire on Experience and Assessment of Work ($n = 244$). The score of each subscale was calculated on a range of 0–100. High scores on psychological demands represented high demands, whereas high scores on control over work and both support scales represented low control or support, respectively; differences relative to the reference group were analyzed using t -tests with * $P < 0.05$ and ** $P < 0.01$.

Table 4. The relationship between sickness absence and psychosocial work conditions

	Short episodes ^a , rate ratio (95% CI)	Medium episodes, rate ratio (95% CI)	Long episodes, rate ratio (95% CI)
Individual level			
Psychological demands	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (0.9–1.0)
Control over work	1.0 (0.9–1.0)	1.0 (0.9–1.0)	1.0 (0.9–1.0)
Demands \times control	1.1 (1.0–1.1)	1.1 (0.9–1.3)	1.1 (1.0–1.2)
Coworker support	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.1)**
Supervisor support	1.0 (1.0–1.0)	1.0 (1.0–1.0)	1.0 (1.0–1.0)
Workplace level			
Department C ^b	1.3 (0.9–2.0)	1.5 (0.8–3.0)	0.7 (0.3–2.0)
Department D ^b	1.5 (1.1–2.0)**	1.1 (0.6–1.9)	2.0 (1.0–3.9)*

Relation between short (1–7 days), medium (8–21 days) and long (>21 days) episodes of sickness absence and the demand–control model, including combined demands and control (demands \times control) assessed by all 244 participants and adjusted for age and gender; * $P < 0.05$ and ** $P < 0.01$.

^aNegative binomial distribution.

^bRelative to the reference group (departments A and B combined).

relations between sickness absence and self-perceived psychosocial work conditions. The cross-sectional assessment of work conditions with self-report questionnaires is impeded by potential shared method variance or shared response biases, resulting in an overestimation of associations at the individual level. The results of the study were not necessarily representative of the total working population, as we restricted our research to one company.

Our study population was a sample of convenience including all employees ($n = 395$) working in an insurance company. They had comparable educational levels (senior secondary vocational educations in administration, book-keeping or insurance) and income. These factors are usually regarded as a proxy for the socioeconomic status of workers. Therefore, the employees could be considered a homogeneous group with regard to their social class.

The study included employees with an above average income. Future research should clarify whether the results found in this study also apply for workers of lower socioeconomic status. Finally, coping styles and factors not related to the workplace were not controlled for. It is possible that differences in coping with work demands explained why employees in departments A and B felt less distress than those working in departments C and D. Higher absence levels in departments C and D could also point to differences in coping, as passive-avoiding coping styles are associated with sickness absence [18]. However, higher departmental absence levels could also indicate poorer health of employees.

Most studies on psychosocial work conditions have used the employee's reports of their work, which may relate as much to personal factors as to the work environment itself. Others have used some form of external assessment that may overlook the employees' perceptions of their work environment. In the Whitehall II Study, for example, psychosocial conditions assessed by personnel managers were not highly correlated with those reported by employees [19]. Our study investigated the relationship between sickness absence and individually reported psychosocial work conditions as well as observed departmental psychosocial work conditions. The perception of psychosocial work conditions, particularly job control, at the individual level differed from the assessment at the departmental level. Self-reported psychosocial work conditions might reflect personal perceptions rather than the actual work environment. It is possible that workers who complained about psychosocial work conditions in their questionnaire responses did not do so in the presence of colleagues and supervisor during the interviews. Another explanation for the differences found could be that the interviews included workers who did not return their questionnaires.

At the individual level, psychosocial work characteristics were not strongly (rate ratios ranging from 0.95 to 1.11) related to sickness absence. In accordance with previous studies, we found a relationship between coworker support and sickness absence. Melchior *et al.* [6] reported

poor workplace social support to be associated with increased rates of short, medium and long absence among men only. Moreau *et al.* [8] found that low social support at work is predictive of sick leave in both sexes. Our results showed that low coworker support was associated with higher rates of long duration absence but the height of the rate ratio raises questions on the clinical importance of this finding. Nielsen *et al.* [20] concluded that low supervisory support predicted short and long episodes of sickness absence in men but not in women. We could not confirm an association between supervisor support and sickness absence in our study.

Lack of job control was found to explain 12% of registered sick leave days in a 2-year follow-up of 1919 Danish workers [21]. Many studies have reported low levels of job control to be related to more frequent and longer absences. We found no relationship between sickness absence and job control at the individual level, although there were indications that a self-reported combination of high demands and low control was related to sickness absence with borderline significance. Job control independently assessed at the workplace level was related to sickness absence, as absence rates were higher in the department with less control over work.

Identification of distressing work environments is necessary to devise and implement interventions to reduce distress and prevent or minimize resulting sickness absence. The finding that psychosocial work conditions assessed at the workplace level were associated with sickness absence suggest that workplace oriented interventions to improve the psychosocial work environment could influence absence levels. Bond and Bunce [22] tested whether a work reorganization intervention could reduce job stress by increasing the employee's job control. The intervention significantly improved mental health, sickness absence rates and self-rated performance after a 1-year follow-up. Our results support the importance of the control dimension as the department with combined high demands and low control had higher rates of absence, and in particular long duration sickness absence.

The role of the supervisor in workplace interventions remains to be investigated. Using departments of a sales and services company as unit for randomization, Kawakami *et al.* [23] performed a controlled trial to determine the effects of supervisor training on mental health at work. They failed to show a clear effect on reduction of job stress, but concluded that the intervention may be useful for maintaining worker autonomy and improving the friendliness of the workplace atmosphere. In our study, employees working in department C perceived more supervisor support than the reference group. Although supervisor support was not related to individual sickness absence, it is possible that it buffered the adverse effects of self-perceived high demands and low control in this department.

This study showed that self-reported psychosocial work conditions were not significantly related to sickness

absence and differed from such conditions assessed at the workplace level. The department with combined high demands and low control had higher rates of short and particularly long absences. The fact that psychosocial work conditions and their relationship with sickness absence depended on the level and manner of assessment of the former warrants more multilevel studies on psychosocial work environments.

Key points

- Self-assessed job demands, job control and their combination were not significantly related to sickness absence.
- Employees had higher rates of short and particularly long episodes of absence in the department in which demands were high and control over work low.
- The differing results of assessing psychosocial work conditions at the individual and the workplace level might explain the inconsistent findings in literature on the relationship of these conditions with sickness absence. This warrants more multi-level studies.

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Conflicts of interest

None declared.

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